Oral Abstract Session 6

Allergens and Air Pollution Exposure, and Their Health Impact

May 11, Saturday 2019

Cheol-Woo Kim (Inha Univ.),
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The Study for Revision of Threshold Levels for Oak, Pine, Ragweed, and Japanese Hop in Seoul Metropolitan Area, Korea

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Background and Purpose: Whereas most of our knowledge on threshold values and symptom development is based on pollen counts in ambient air determined by a pollen sampler in a certain area. But there has been used a risk grade modified from several countries in Korea. This study was evaluated to upgrade pollen threshold levels for Korean risk grade for pollen allergy.
Methods and Materials: Pollens were collected daily from Seoul and Guri as its suburban area by using 7 Day-Burkard sampler (Burkard Manufacturing Co Ltd, Hertfordshire, UK) for 8 years. Oak, pine, Japanese hop and ragweed were selected for study as common pollens in Korea. and Total 1,007 Subjects for allergy for those pollens were recruited from Hanyang University Seoul Hospital (n=248 for Spring, n=240 for Autumn), and Hanyang University Guri Hospital (n=258 for Spring, n=261 for Autumn) for 8 years. Symptom index (SI) was evaluated and recorded by phone-calling to study subjects daily or asking allergic symptoms questionnaires when they visit outpatient clinic every week for the evaluation of the relation between pollen concentration and the outbreak of allergic diseases.
Results: Sensitization rates for pollen, especially oak, pine for Spring, and ragweed and Japanese hop for Autumn were increased annually. The correlation between pollen count and SI was highest between pollen and SI at the same time points. The correlation coefficient between pollen (t) and SI (t) of oak was 0.20, pine was 0.16, ragweed was 0.31, and Japanese hop was 0.34. Threshold for risk grade of pollens (oak, pine, ragweed, and Japanese hop) were revised
Conclusion: The revision of risk grade for pollen allergy may be very crucial to the prediction model for pollen and will be useful to patients with pollen allergy in Korea. There need to revise to pollen threshold levels of common pollens according to updated results from adjusted symptom index of each pollen allergic patients in Seoul metropolitan area, Korea

Key Words: Pollen allergy, Threshold level, Korea

A Hypoallergenic Peptide Mix Containing T Cell Epitopes of the Clinically Relevant House Dust Mite Allergens

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Background: In the house dust mite (HDM) *Dermatophagoides pteronyssinus* Der p 1, 2, 5, 7, 21 and 23 have been identified as the most important allergens. The aim of this study was to define hypoallergenic peptides comprising the sequences of the six allergens and to use peptides and the complete allergens to study antibody, T cell and cytokine responses in sensitized and non-sensitized subjects.
Methods: IgE reactivity of HDM-allergic and non-HDM-sensitized individuals to 163 allergen molecules including 15 HDM allergens was established using ImmunoCAP ISAC technology. Thirty-three peptides covering the sequences of the six HDM allergens were synthesized and purified. Allergens and peptides were tested for IgE and IgG reactivity by ELISA and ImmunoCAP, respectively. Allergenic activity was determined by basophil activation. Specific CD4+ T cell and cytokine responses were determined in PBMC cultures by CFSE dilution and Luminex technology, respectively.
Results: HDM-allergics showed IgE reactivity only to complete allergens whereas 31 of the 33 peptides lacked relevant IgE reactivity and allergenic activity. IgG antibodies of HDM-allergic and non-sensitized subjects were directed against peptide epitopes and higher allergen-specific IgG levels were found in HDM-allergics. PBMC from HDM-allergic patients produced higher levels of allergen-specific IL-5 whereas non-HDM-sensitized individuals mounted higher levels of IFN-gamma, IL-17, pro-inflammatory cytokines and IL-10.
Conclusion: IgG antibodies in HDM-allergic patients are not protective because they recognize peptide epitopes which are different from the epitopes recognized by IgE. A mix of hypoallergenic peptides comprising the relevant T cell epitopes of the most important HDM allergens was identified.

OAS-58

Comparison of Pollen Scattering, Sensitization, and Pollen-Fruit Syndrome for Allergic Child in Busan and Fukuoka

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Introduction: Busan and Fukuoka are geographically close. We tried to find similarities and differences by comparing pollen dispersion, sensitization, and PFS (Pollen-Fruit Syndrome) to see whether the two areas were affected each other in allergic children. **Method**: In 2017, an allergy child aged between 6 and 15 was studied for one year. The ISSAC questionnaire investigated bronchial asthma (BA), allergic rhinitis (AR), atopic dermatitis (AD) and food allergy (FA), The PFS questionnaire kinds of fruits, vegetables, and symptoms. Busan collected pollen through rotorod sampler and Fukuoka through Durham sampler. After dyeing Calberia, pollen species and numbers were observed under a microscope. Blood tests measured sIgE for pollen. The pollen species were Japanese Cedar, Cypress, Juniper, Birch, Alder, Pine, HDM (house dust mite), Ragweed, Japanese Hop, Orchard Grass, Tomato, and Peach. **Results**: 57 Busan and 56 Fukuoka were registered. There were no age or gender differences, and no AR or AD differences, but the BA and FA were higher in Fukuoka. ($p<0.05$) The main pollen in Busan were Pine (80.5%), Alder (15.7%), Juniper (3.2%) and Birch (0.6%) respectively. Fukuoka was Cypress (69.3%), Japanese Cedar (26.5%), and Pine (4.1%). SIgE had higher levels of all pollen in Fukuoka than in Busan except birch and alder. ($p<0.05$) PFS were apple, peach, kiwi, peanut and teenut in Busan, which were associated with birch, alder sIgE ($p<0.05$) and PR-10. Fukuoka reports kiwi, banana, mongo, pineapple, tomato, mandarin, and chestnut, which were associated with grass and weed, but there was no statistically significant relationship. **Conclusion**: Busan and Fukuoka are geographically close, but pollen scattering, sensitization, and PFS are different. In childhood allergies, birch and alder are important in Busan, resulting in PR-10 PFS. Cypress, Japanese Cedar and various pollen dispersed and sensitized in Fukuoka, resulting in Grass or weed associated PFS.

Key Words: Pollen, Seasonal allergic rhinitis, Food hypersensitivity

OAS-59

The Cross Reactivity between Fermented Milk and Mugwort

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Purpose: We performed to study the clinical manifestations of allergenic sensitization to fermented mare's milk in patients with allergic to mugwort and define the molecular weights of purified allergenic proteins and evaluate their allergenic cross-reactivity. **Methods**: We were prepared extracts of fermented mare's milk and mugwort by Hames Richmond's method and their allergenic proteins were identified molecular weights by method of SDS-PAGE. ELISA inhibition experiments were done to study allergen-specific IgE testing and cross-reactivity between fermented mare's milk and mugwort. **Results**: In SDS-PAGE were determined mugwort allergens 12-43 kDa, fermented mare's milk (airag) allergens 12-68 kDa molecular weights. On the mugwort-ELISA inhibition test, the 50 % inhibitory dose to mugwort-specific IgE was $0.01\,\mu g/ml$ of mugwort allergens and $0.025\,\mu g/ml$ of airag allergens. However, $1.0\ \mu g/ml$ of mugwort and airag allergens were completely inhibited to mugwort-specific IgE and airag -specific IgE antibodies. ELISA inhibition showed that IgE binding to airag was totally inhibited by $10\ \mu g/ml$ of mugwort, whereas $1\ \mu g/ml$ of both mugwort and airag totally inhibited the mugwort. **Conclusion**: Fermented mare's milk contained 12-68 kDa molecular weights allergen proteins and on the ELISA inhibition study was strongly cross-reactivity between fermented mare's milk and mugwort allergens.

OAS-60

Allergenic Characterization of the Novel 30 kDa Lipoprotein from Silkworm Pupa

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Background: Silkworm pupa is widely consumed in Asian countries and allergic reactions after ingestion have been described. However, false-positive reactions by in vivo and in vitro serological test to total extract of silkworm pupa make diagnosis difficult. This study aimed to identify and characterize the novel clinically relevant allergen from silkworm pupa.
Method: A novel IgE reactive allergen, a low molecular 30 kDa lipoprotein, was identified by a proteomic analysis. Recombinant protein was overexpressed in Escherichia coli, and purified by affinity chromatography using Ni-resin. IgE reactivity of recombinant proteins was compared by ELISA with the other allergenic proteins: arginine kinase (Bomb m 1), 27 kDa glycoprotein, tropomyosin, and 30 kDa lipoprotein.
Results: Recombinant 30 kDa lipoprotein was recognized by IgE antibodies from all 17 sera from allergy patients, whereas IgE binding frequency for the other proteins were 35.3% (6 of 17) for 27 kDa glycoprotein, and 0% for arginine kinase and tropomyosin. IgE reactivity increased significantly, especially for 30 kDa lipoprotein, when 4 M urea was added to denature the protein structure in serum samples for ELISA, indicating that linear epitopes play a major role for IgE recognition.
Conclusion: A novel allergen 30 kDa lipoprotein displayed a strong IgE reactivity. Recombinant allergens produced in this study may facilitate the development of better allergy diagnostics for silkworm allergy.

Key Words: Food allergen, Allergy diagnosis, Silkworm pupa

OAS-61

Risk of Childhood Asthma is Affected by Prenatal Exposure to PM10, Gender and NRF2 Polymorphism

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Background: Prenatal particulate matter (PM) exposure may increase maternal systemic and fetal oxidative stress resulting in adverse effects on fetal immune and lung development. Epidemiologic studies have shown that prenatal exposure to PM is associated with increased risk of childhood asthma. The association may be modified by gender, exposure timing, and reactive oxidative species. To date, little is known about whether the effect of PM10 on childhood asthma is mediated through oxidative stress related genes.
Methods: We included 1,576 child-mother pair from the Panel Study of Korean Children (PSKC) birth cohort study, which is a nationwide birth cohort study. PM10 exposure during pregnancy was estimated using land-use regression models based on national monitoring system. Children were classified as having asthma if a parent-reported physician diagnosis of asthma ever at age 7 years. TaqMan was used for genotyping of nuclear factor erythroid 2-related factor, Nrf2(rs6726395) polymorphism. Logistic regression was used to assess the risk of childhood asthma relation to prenatal PM10 exposure, sex, and Nrf2 genotype.
Results: Overall, higher PM10 exposure during first and second trimester was associated with an increased risk of childhood asthma (first trimester adjusted odds ratios [aOR]=1.63; 95% confidence interval [95% CI]= 1.02-2.61, second trimester aOR=2.34; 95% CI=1.33-4.10, respectively). By child's gender, we found that higher PM10 exposure in the second trimester were significantly associated with the childhood asthma risk in boys (aOR=3.29; 95% CI=1.68 - 6.42), not in girls. When modifying the effects of prenatal PM10 exposure and child's gender on childhood asthma by Nrf2 genotype, higher PM10 exposure during second trimester increased the risk of asthma in boys with the Nrf2 GG genotype.
Conclusions: The effect of PM10 exposure during second trimester in pregnancy on childhood asthma was modified by child's and NRF2 polymorphism.

Key Words: Asthma, Prenatal PM10 exposure, Gender, Nrf2

Effect of Prenatal Particulate Matter Exposure on Phenotypes of Atopic Dermatitis in Preschool Children Modified by Cord Blood Vitamin D: COCOA Study

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Purpose: Atopic dermatitis (AD) has different effects on asthma and allergic rhinitis later in life depending on onset and natural course. Maternal particulate matter (PM) exposure and vitamin D during pregnancy are associated with AD of offspring. Whether PM2.5 and vitamin D during pregnancy influence AD differently depending on onset and natural course have not been evaluated. The purpose of this study are to determine whether onset and natural course of AD are differently associated with PM2.5 exposures during each trimesters of pregnancy and to determine whether cord blood vitamin D modifies effects of PM2.5 on AD in preschool children.
Methods: This study included 2,878 mother-child pairs from the Cohort for Childhood Origin of Asthma and allergic diseases (COCOA). Levels of PM2.5 during pregnancy were estimated for addresses by land-use regression models based on national monitoring system. The prenatal period was divided into three trimesters: from week 1 through 13 (first), week 14 through 27 (second) and from week 28 through week 40 (third). A diagnosis of AD was based on parental report of a physician's diagnosis.
Results: A higher PM2.5 exposure during first and second trimester of pregnancy was associated with early onset transient AD (aOR 1.48, 95% CI 1.00-2.19 and aOR 1.70, 95% CI 1.16-2.49, respectively), but not early onset persistent and late onset AD. Low cord blood vitamin D increased the effects of PM2.5 exposure during first trimester of pregnancy on early onset persistent AD (aOR 3.03, 95% CI 1.20-7.64), but not early onset transient and late onset AD.
Conclusions: Higher PM2.5 exposure during the first and second trimester of pregnancy may increase the susceptibility to early onset AD. Low cord blood vitamin D increases the persistency of AD associated with PM2.5 exposure during the first trimester of pregnancy. Avoidance of exposure to PM2.5 and interventions to increase vitamin D levels during prenatal period may prevent the develop of AD

Key Words: Particulate matter, Vitamin D, Atopic dermatitis

Air Pollution Deteriorates Asthma Symptoms by Affecting Innate Lymphoid Cells

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Background: Air pollution is a risk factor for various diseases with immediate or long term effect. Air pollution contains several dust, particles, ozone, or diesel fumes, and these molecules might induce airway inflammation and asthma symptoms. However, how these molecules have effect on our immune system in airway, especially on innate immune system in asthmatic airways, is still not clear.
Objective: To identify the effect of air pollution on asthmatic airways by using asthma control test (ACT), lung function, and innate immune cells subsets in induced sputum and peripheral blood.
Methods: We collected induced sputum and peripheral blood mononuclear cells (PBMC) from healthy controls and patients with asthma and analyzed by flow cytometry. Correlations were assessed between asthma related symptoms or innate immune cells subsets and air pollution index of their residence provided by AirKorea (www.airkorea.or.kr) at the day of sampling or one day before sampling.
Results: Asthmatic patients presented uncontrolled symptoms (lower ACT) and tended to have lower lung function (FEV1/FVC) as the level of the particulate matter 10 μm (PM10) were higher in their residential area. However, healthy controls were not affected by environmental PM10 concentration. PM2.5 or ozone did not show any correlation with ACT or lung function. In innate lymphoid cell (ILC) analysis, ILC2s were significantly higher in sputum and blood of subjects residing in higher PM10 environment while ILC1s showed the opposite. Higher ozone (O3) concentration promoted increase of total ILCs and ILC1s in induced sputum but not in PBMC. On the other hand, ozone concentration had negative correlation with the frequency of alveolar macrophages in induced sputum. However, air pollution index and T cells did not have any correlation.
Conclusion: Air pollution rather affects innate immune system than adaptive immune system, especially innate lymphoid cells, and accelerates asthma-related symptoms.

Key Words: Air pollution, Asthma, Innate lymphoid cells

OAS-64

The Effect of Mechanical Air Purifier for Improving Allergic Symptom Scores of Allergic Children

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Rationale: The air quality and pollution in the air is completely dependent on the surroundings one lives in. Capturing ourselves indoor during the high level of pollution also needs readdress as indoor air is usually dirtier than the air outdoors, due to trapping of air contaminants inside. Children as they are most likely to stay indoors for longer durations. This study aimed to evaluate the change of allergic symptoms from allergic children by using air purifier.

Methods: 45 allergic children were recruited from Hanyang university Guri Hospital Pediatric Allergy Clinic (18 children with atopic dermatitis, 18 with allergic rhinitis, 9 with asthma). Samsung air purifier was set up subject's family room and operated with filter-on for 28 days as acting day and filter-off for 28 days as control with average 14 hrs/d (8-24 hrs/d) since September 2018. Allergic symptom scores were self-checked on smart cellular phone by subjects' parents as Atopic dermatitis: SCORAD, allergic rhinitis: Total 4 nasal symptom score (T4NSS), Asthma: Asthma symptom score(ASS). At same period level of the PM10, PM2.5, pollens and NO2, SO2, O3 were measured and recorded daily for air quality.

Results: Mean improved rate of SCORAD were 15.16%, T4NSS was 28.86%, ASS was 50.7% at on-filter of air purifier phase than at off-filter phase. There was no significant correlation between allergic symptom scores and the level of air pollutants and pollens in this period but showed the lag-effect trend between them.

Conclsion: Allergic symptom scores were improved by using mechanical air purifier set up in house of allergic children.

Key Words: Air purifier, Children, Allergy

OAS-65

Effects of Air Purifiers on Patients with Allergic Rhinitis: A Multicenter, Randomized, Double-Blind, and Placebo-Controlled Study

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Background: Exposure to particulate matter (PM) is a well-known risk factor of symptom exacerbation and it can facilitate sensitization of allergen to the allergic airway disease patients. Indoor environments, where people spend most of their time, are of utmost importance.

Objective: To assess the effects of air purifiers (equipped with high-efficiency particulate air [HEPA] filters) on allergic rhinitis (AR) in adult Korean patients by conducting a multicenter, randomized, double-blind, and placebo-controlled study during out of the pollen season.

Methods: Patients with persistent AR were randomly assigned to the active or mockup (placebo) air-purification groups. Two air purifiers (living room and bedroom) were operated for 6 weeks in each home environment. The primary study endpoint was to achieve improvement in AR symptoms and medication scores. Secondary endpoints were to achieve improvement in quality of life (QoL) and visual analog scale (VAS) scores, and in indoor (bedroom and living room) concentrations of PM2.5 and PM10.

Results: After 6 weeks of air purifier use, medication scores improved significantly in the active (vs. placebo) group, although subjective measures (symptoms, VAS, and QoL scores) did not differ. Bedroom PM2.5 concentrations initially exceeded living room or outdoor levels, but declined (up to 51.8%) following active purifier operation. Concentrations of PM2.5 in living room and PM10 in bedroom and living room were also significantly reduced through active purification.

Conclusions: Use of air purifiers with HEPA filters significantly reduced medication requirements for patients with persistent AR and significantly lowered indoor PM2.5 concentrations, regardless of room placement. Active intervention to reduce household air pollutants may help improve allergic airway disease.

Key Words: Indoor pollution, Air purifier, Allergic rhinitis, Particulate matter

May 11, Saturday

OAS-66

Diagnostic Values of Skin Prick Test and Allergen-Specific IgE in Evaluating Dog and Cat Allergies among Participants from the Pet Exhibition in Korea

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Background: Diagnostic values of skin prick tests (SPTs) and allergen-specific IgE(sIgE) measurement in evaluating dog and cat allergies is undetermined. This study evaluated diagnostic values of allergen sIgE in comparison with SPTs in the diagnosis of dog and cat allergies among Korean adults
Methods: A total of 582 participants who attended 2018 Pet exhibition in Korea completed self-reported questionnaires regarding allergies to dogs and cats. They underwent SPTs and sIgE measurements to dog and cat allergen. sIgE were measured by ImmunoCAP (Thermofisher, Uppsala, Sweden).We compared sIgE tests with three commercially available SPT reagents (Lofarma, Milano, Italy; Hollister-Stier, Spokane, WA, USA; Bencard, Bradford, UK)
Results: In 582 subjects, 114 (19.6%) and 134 (23.0%) experienced respiratory or dermatologic allergic symptoms during exposure to dog and cat, respectively. Sensitivity, specificity, positive predictive value, and negative predictive value of SPTs using dog allergen among 432 subjects were as follows:17.4%, 87.7%, 25.9%, 81.0% in Lofarma, 29.1%, 86.4%, 34.7%, 83.1% in Hollister-Stier and 34.9%, 76.7%, 26.3%, 82.4% in Bencard. Those of SPTs using cat allergen were 29.5%, 86.7%, 38.4%,81.3% in Lofarma, 49.5%, 76.3%, 37.0%, 84.3% in Hollister-Stier and 66.8%, 72.7%,37.0%, 86.7% in Bencard using cat allergen. In allergen-sIgE among these participants, their values were 58.4%, 79.5%, 41.3%, 88.4%, for dog dander and 60.0%, 78.0%, 43.5%, 87.4% for cat dander.
Conclusion: Serum sIgE measurement is comparable to SPTs in the diagnosis of dog and cat allergies. However, diagnostic values of two different diagnostic modalities are relatively low. Allergen extracts used in SPTs and sIgE are warranted to be qualified to enhance these values.

Key Words: Skin prick test, Specific IgE, Dogs, Cats